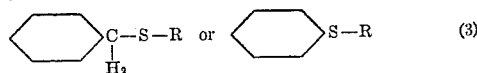


or anthryl radicals. Also, either or both of the aromatic nuclei of the condensed molecule may contain in addition as ring substituents one or more hydroxyl, secondary amino or other antioxidant group and may contain any number of hydrocarbon ring substituents providing that the total number of carbon atoms in either moiety does not exceed 30.

As Equations 1 and 2 above indicate, breakdown of the retarder in the presence of carbon black particles results in the formation of an aryl sulfide or an aryl methylene sulfide radical which then retards oxidation of the polymeric chain by producing



structure which is in turn oxidized to regenerate the sulfide radical together with the ROOR type of structure. Apparently, this ROOR compound is fairly stable and does not result in the initiation of a chain reaction such as is normally produced in a polymeric material such as polyethylene in the presence of oxygen.

Why the reaction set forth above does not occur in clear polyethylene is not known, although it is postulated that the sulfide radical is produced only under the catalytic influence of carbon black. It should be especially noted that the equations above are offered only as a possible explanation of the observed retarder action, and dependence is in no way had upon this explanation either as a basis for the specification or as substantiation for the claims herein.

Since neither of the specific retarder materials for which curves are presented is readily available from a commercial source, the synthesis used for preparing these materials is set forth below:

#### 1. Synthesis of benzyl phenyl sulfide

A 1-liter, 4-necked round bottom flask was equipped with an addition funnel, Hershberg stirrer and a water-cooled condenser. Into the flask was poured a solution of 12 grams (0.52 mol) of sodium metal in 300 milliliters of absolute ethanol. To this was added slowly with stirring at room temperature 57 grams (0.52 mol) of thiophenol. Then 68.8 grams (0.54 mol) of benzyl chloride was added dropwise over a period of about one hour. After the addition had been completed the mixture was refluxed for two hours. The reaction flask was then attached to a distillation column and most of the ethanol was distilled off. The residue while still hot, was poured into a beaker containing 400 grams of ice whereupon a white precipitate was formed which was separated by succession filtrations, was washed twice with 250 milliliter portions of water and was dried to yield 58.2 grams of crystalline material. Recrystallization from ethanol gave pure white crystals which melted at between 41 and 42° C. and in other respects had the known characteristics of benzyl phenyl sulfide.

#### 2. Synthesis of dibenzyl sulfide

Using the same apparatus as that described above, 116 grams (0.92 mol) of benzyl chloride in 300 milliliters of absolute ethanol was placed in the flask. To this was added slowly with stirring at room temperature 110 grams of sodium sulfide monohydrate (0.54 mol) in 50 milliliters of water. Refluxing and stirring were continued for three days. At the end of that period the ethanol was distilled off and the residue was poured into a beaker containing 700 grams of ice. A precipitated solid was obtained which upon heating to a temperature slightly above room temperature was converted to an oil. This oil was poured into a smaller flask which was attached to a Vigreux column to distill off water and unreacted benzyl chloride. Recrystallization of the

residue from 70 percent aqueous ethanol produced a yield of 41 grams of pure white crystals which had a melting point of 49° C.

As is amply set forth above, although the invention has been expressed primarily in terms of specific retarders and a specific amount of carbon black in a specific essentially saturated hydrocarbon polymer containing tertiary hydrogen atoms, a person skilled in the art will recognize that the principles expressed herein are equally applicable to the other retarders and polymers and to the ranges of composition all of which have been set forth. Experimental work carried out using other such materials and the expressed compositional ranges justifies these conclusions.

15 What is claimed is:

1. A composition which is stabilized against oxidation comprising from 0.5 percent to 5 percent by weight of carbon black particles of a maximum size of 1000 angstroms, from 0.01 percent to 5 percent of a thioether containing two carbocyclic benzoid aromatic nuclei at least one of which is joined through a methylene group to the sulfur atom, in which thioether the maximum number of carbon atoms in each moiety including substituents is 30, and an essentially saturated hydrocarbon polymeric material selected from the group consisting of polymers of ethylene, propylene, butene-1, 3-methyl butene-1, 4-methyl pentene-1, 4,4-dimethyl pentene-1, dodecene-1, 3-methyl pentene-1, and mixtures of any of these materials, and in which all weight percents are based on the said composition.

2. The composition of claim 1 in which the polymeric material is a homopolymer.

3. The composition of claim 1 in which the polymeric material is a copolymer.

35 4. The composition of claim 1 in which the thioether is benzyl phenyl sulfide.

5. The composition of claim 1 in which the thioether is dibenzyl sulfide.

40 6. The composition of claim 1 in which the polymeric material is a polymer containing random tertiary hydrogen atoms.

7. The composition of claim 6 in which the polymer is polyethylene.

45 8. The composition of claim 1 in which the polymeric material is a polymer containing ordered tertiary hydrogen atoms.

9. The composition of claim 8 in which the polymer is polypropylene.

50 10. The composition of claim 7 in which the thioether is benzyl phenyl sulfide.

11. The composition of claim 7 in which the thioether is dibenzyl sulfide.

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